

AMENDMENTS TO THE CLAIMS

Please amend the claims as shown directly below. This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended) A method of inhibiting the corrosion of a metal surface[[s]] contacted by an aqueous acid solution comprising:

(a) combining a corrosion inhibiting composition with said aqueous acid solution, said corrosion inhibiting composition comprising the reaction product of an alpha,beta-unsaturated aldehyde or ketone with a primary or secondary amine; and then

(b) contacting said metal surface[[s]] with said aqueous acid solution containing said ~~reaction product~~ corrosion inhibiting composition.

2. (Currently Amended) The method of claim 1 wherein said alpha,beta-unsaturated aldehyde or ketone and said primary or secondary amine are separately added to water used to form said aqueous acid solution wherein said alpha,beta-unsaturated aldehyde or ketone and said primary or secondary amine react and form said corrosion inhibiting reaction product therein.

3. (Currently Amended) The method of claim 1 wherein said metal surface[[s]] comprises at least one metal[[s]] selected from the group consisting of J55 steel, N-80 steel, 13Cr alloy, 25 Cr alloy, Incoloy 825 and 316L.

4. (Currently Amended) The method of claim 1 wherein:
said alpha,beta-unsaturated aldehyde comprises at least one aldehyde[[is]] selected from the group consisting of[[:]] crotonaldehyde, 2-hexenal[[:]], 2-heptenal, 2-octenal[[:]], 2-nonenal, 2-decenal, 2-undecenal, 2-dodecenal, 2,4-hexadienal, 2,4-heptadienal, 2,4-octadienal, 2,4-nonadienal, 2,4-decadienal, 2,4-undecadienal, 2,4-dodecadienal, 2,6-dodecadienal, citral[[:]], 1-formyl-[2-(2-methylvinyl)]-2-n-octylethylene, cinnamaldehyde, dicinnamaldehyde, p-hydroxycinnamaldehyde, p-methylcinnamaldehyde, p-ethylcinnamaldehyde, p-methoxycinnamaldehyde, p-dimethylaminocinnamaldehyde, p-diethylaminocinnamaldehyde, p-nitrocinnamaldehyde, o-nitrocinnamaldehyde, o-allyloxycinnamaldehyde, 4-(3-propenal)cinnamaldehyde, p-sodium sulfocinnamaldehyde, p-trimethylammoniumcinnamaldehyde sulfate, p-trimethylammoniumcinnamaldehyde o-methylsulfate, p-thiocyanocinnamaldehyde, p-(S-acetyl)thiocinnamaldehyde, p-(S-N,N-dimethylcarbamoylthio)cinnamaldehyde, p-chlorocinnamaldehyde, 5-phenyl-2,4-pentadienal, 7-

phenyl-2,4,6-heptatrienal, 5-(p-methoxyphenyl)-2,4-pentadienal[;], 2,3-diphenylacrolein, 3,3-diphenylacrolein, α -methylcinnamaldehyde, β -methylcinnamaldehyde, α -chlorocinnamaldehyde, α -bromocinnamaldehyde, α -butylcinnamaldehyde, α -amylcinnamaldehyde, α -hexylcinnamaldehyde[;], 2-(p-methylbenzylidene)decanal, α -bromo-p-cyanocinnamaldehyde, α -ethyl-p-methylcinnamaldehyde, p-methyl- α -pentylcinnamaldehyde, 3,4-dimethoxy- α -methylcinnamaldehyde, α -[(4-methylphenyl)methylene]benzeneacetaldehyde, α -(hydroxymethylene)-4-methylbenzylacetaldehyde, 4-chloro- α -(hydroxymethylene)benzeneacetaldehyde, α -nonylidenebenzeneacetaldehyde, 3,7-dimethyl-2,6-octadienal, and beta-hydroxy aldehydes which dehydrate to form alpha,beta-unsaturated aldehydes under acidic conditions; and

said alpha,beta-unsaturated ketone[s] comprises at least one ketone[are] selected from the group consisting of[:] 4-phenyl-3-buten-2-one, 3-methyl-1-phenyl-2-buten-1-one[;], 4-phenyl-3-penten-2-one[;], 5-phenyl-4-penten-3-one[;], 6-phenyl-5-hexen-4-one[;], 7-phenyl-6-hepten-4-one-2-ol[;], 7-phenyl-6-hepten-4-one[;], 1,3-diphenyl-2-propen-1-one[;], 1,3-diphenyl-2-buten-1-one[;], dicinnamalacetone[;], 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,5-dione, mesityl oxide[;], phorone[;], isophorone[;], 3-methyl-2-cyclohexen-1-one[;], 3,6-dimethyl-2,6-cycloheptadien-1-one[;], 5-methyl-4-hexen-3-one[;], and beta-hydroxy ketones which dehydrate to form alpha,beta-unsaturated ketones under acidic conditions.

5. (Currently Amended) The method of claim 1 wherein said primary or secondary amine comprises at least one amine[is] selected from the group consisting of ethanolamine, diethanolamine, partially ethoxylated dehydroabietylamine, ethylamine, diethylamine, dehydroabietylamine, propylamine, dipropylamine, propanolamine, isopropanolamine, 2-propanol-1-amine, diisopropanolamine, butylamine, dibutylamine, tert-butylamine, pentylamine, dipentylamine, and tert-benzyl-tert-butylamine.

6. (Original) The method of claim 1 wherein said reaction product results from the reaction of said primary or secondary amine with said alpha,beta-unsaturated aldehyde or ketone at a molar ratio of amine to aldehyde or ketone in the range of from about 0.1:1 to about 4:1.

7. (Original) The method of claim 1 wherein said corrosion inhibiting composition is combined with said aqueous acid solution in an amount in the range of from about 0.01% to about 5% by weight of said aqueous acid fluid.

8. (Original) The method of claim 1 wherein said corrosion inhibiting composition further comprises one or more of an iodide source, a solvent or a surfactant.

9. (Currently Amended) The method of claim 1 wherein said aqueous solution comprises water and ~~an~~ at least one acid selected from the group consisting of hydrochloric acid, acetic acid, formic acid, and hydrofluoric acid ~~and mixtures thereof~~.

10. (Original) The method of claim 1 wherein said aqueous acid solution comprises water and hydrochloric acid, said hydrochloric acid being present in an amount in the range of from about 5% to about 28% by weight of aqueous acid fluid.

11. (Currently Amended) The method of claim 1 which further comprises contacting said metal surface[[s]] with said aqueous acid solution at temperatures up to about 300°F when said aqueous acid solution comprises hydrochloric acid at a concentration of about 15% by weight thereof.

12. (Withdrawn) The method of claim 1 which further comprises contacting said metal surfaces with said aqueous acid fluid at temperatures up to about ~~225°F~~ 275°F when said aqueous acid solution comprises hydrochloric acid at a concentration of about 28% by weight thereof.

13–24. (Cancelled)

25. (New) The method of claim 1 which further comprises contacting said metal surface with said aqueous acid solution at temperatures up to about 300°F when said aqueous acid solution comprises hydrochloric acid at a concentration of from about 15% to about 28% by weight thereof.

26. (New) The method of claim 1 wherein said corrosion inhibiting composition further comprises at least one component selected from the group consisting of a quaternary ammonium compound; a corrosion inhibitor activator; an acetylenic alcohol; a Mannich condensation product formed by reacting an aldehyde, a carbonyl containing compound, and a nitrogen containing compound; an unsaturated carbonyl compound; an unsaturated ether compound; formamide; formic acid; a formate; another sources of carbonyl; an iodide, a terpene, and an aromatic hydrocarbon.

27. (New) The method of claim 26, said quaternary ammonium compound having the formula:



wherein each R is the same or a different group selected from long chain alkyl groups, cycloalkyl groups, aryl groups or heterocyclic groups, and wherein X is an anion.

28. (New) The method of claim 26 wherein said quaternary ammonium compound comprises at least one compound selected from the group consisting of an N-alkylpyridinium halide, an N-cycloalkylpyridinium halide, an N-alkylarylpyridinium halide, an N-alkylquinolinium halide, N-cycloalkylquinolinium halide, and an N-alkylarylquinolinium halide.

29. (New) The method of claim 26 wherein said quaternary ammonium compound is present in said corrosion inhibiting composition in an amount in the range of from about 1% to about 45% by weight of the corrosion inhibiting composition.

30. (New) The method of claim 26 wherein said corrosion inhibitor activator comprises at least one activator selected from the group consisting of cuprous iodide, cuprous chloride, an antimony compound, an antimony oxide, an antimony halide, antimony tartrate, antimony citrate, an alkali metal salt of antimony tartrate, an alkali metal salt of antimony citrate, an alkali metal salt of pyroantimonate, an antimony adduct of ethylene glycol; a bismuth compound, a bismuth oxide, a bismuth halide, bismuth tartrate, bismuth citrate, an alkali metal salt of bismuth tartrate, an alkali metal salt of bismuth citrate, iodine, an iodide compound, and formic acid.

31. (New) The method of claim 26 wherein said corrosion inhibitor activator is present in said corrosion inhibiting composition in an amount in the range of from about 0.1% to about 5.0% by weight of the composition.

32. (New) A method comprising:
introducing an aqueous acid solution comprising a corrosion inhibiting composition into at least a portion of a subterranean formation, wherein the corrosion inhibiting composition comprises the reaction product of an α,β -unsaturated aldehyde or ketone with a primary or secondary amine.